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Indonesia Cocoa Bean in International Trade

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Abstract---This study was conducted to determine whether the variable amount of production of cocoa beans, cocoa plantation area, the number of exports of cocoa beans, cocoa stock domestic, world cocoa prices, the exchange rate and overseas income influence the supply and demand of Indonesian cocoa beans. Through various variables descriptions above, such as the amount of production of cocoa beans, the number of exports of cocoa beans, cocoa stocks, world cocoa prices, foreign income, exchange rate or the exchange rate, this research focused on an econometric model of the Indonesian Cocoa Supply and Demand. the results of this study are on the supply function of Indonesian cocoa on the international market, with the independent variables are used (level of productivity of Indonesian cocoa plantations, the exchange rate, the price expectations of the world cocoa and cocoa previous year supply or lag 1) shows that the variation deals cocoa beans can be explained by a variable-variable in the model, amounting to 95.91 percent. Variable price expectations (PE), the productivity of Indonesian cocoa plantations (K), the number of supply cocoa beans (QS) has a positive relationship with the cocoa bean supply at present. While variable-rate (K) was negatively related.

Keywords---econometrics models, exports of cocoa, Indonesia cocoa bean, international trade, world cocoa prices.

Introduction

Aside from the health side (consumption proportionally), cocoa variants offered by the food and beverage industry increasingly diverse, which has an impact on the increased number of cocoa consumption. This is indicated either by the industrial progress Cocoa Processed world. Diversification of processed cocoa products made by the world cocoa industry (the 10 largest companies) recorded net sales (net sales) in 2018 amounted to the US \$ 75.101 million or IDR 690 trillion, which is equivalent to 50% of the value of the Indonesian national budget in the same year (IDR 1.222 Trillion).

The existence of the processed cocoa industry (grindings) very depends on the supply of cocoa beans. The graph below shows that the number of deals cocoa beans in the last few years is relatively equal in number to the production of processed cocoa. It also indicates that world cocoa stocks are relatively limited. Observed more, there are three (3) highest countries producer of cocoa beans (cocoa beans) in the world, Cote d'Ivoire (Ivory Coast), Ghana, and Indonesia. Contributions of these three countries in the production of cocoa beans (cocoa beans) for the year 2005-2018 have an average of 40%, 18%, and 13%.

Level trade cocoa beans from Ivory Coast and Indonesia showed relatively slower growth than Ghana. Ghana cocoa beans have a higher quality than Indonesian cocoa beans. Executive Director ICCO January [Aybek et al. \(2007\)](#), states that a trend towards declining quality and supply of cocoa from Indonesia. Indonesia cocoa, which mostly comes from South Sulawesi contaminated with many foreign objects categorized as junk. Interestingly, the countries in Europe (Germany and the Netherlands) and the United States can create value-added for their countries through cocoa beans produced by some countries in Africa and Asia, even they become the dominant supplier of processed cocoa (grindings).

Average production of cocoa in Europe and America respectively by 43% and 25%. While on two continents (Africa and Asia Oceania) as a producer of cocoa beans (cocoa beans) only produce cocoa (grindings) by 31%. Processed cocoa production continues to increase dominated by countries that have high-income levels (Europe and America). In contrast, the production of cocoa beans is dominated by countries with smaller per capita income (Africa, Asia, and Oceania).

Traffic trade cocoa beans and cocoa grindings, currently coordinated by the International Cocoa Organization (ICCO), which is headquartered in London. ICCO was established in 1973 (based on the International Cocoa Agreement) which consists of 41 countries, consisting of 19 producer countries and 22 consumer countries. ICCO's established goal, to create a balance of the world cocoa economy with stable prices (Gagnon, 1993; Gereffi, 1999).

Before joined ICCO, cocoa beans trade was undertaken by Indonesia in the form of exports and imports relative dominated by bilateral trade. In 2017, Indonesia realizes its wish to become a member of the world cocoa producer (Ardhana & Fleet, 2003; Saltini et al., 2013; Hoffmann et al., 2020). Indonesia joining the ICCO, is expected to minimize discrimination against Indonesian cocoa, which is experienced in the form of a discount imposition of cadmium, the imposition of tariffs in the European Union. On the other hand, exports of cocoa from African countries/Commonwealth into Europe until the current duty-free, while Indonesia imposed import tariffs of 14.7%. Also, Indonesia's policy to join the ICCO also to avoid problems such as Cacao Detention is based because the low-quality standards (unfermented cocoa beans correctly) as well as the shipping procedure that is not managed well by Indonesian exporters.

Studies conducted by Rifin & Naully (2013), explain that exporters of Indonesian cocoa, mixing with cocoa beans imported before re-export. This is done to avoid arrest automatic detention in destination countries that will lead to price cuts and handling fees again (reconditioning) (Rifin, 2013; Nabhani et al., 2015; Tresliyana et al., 2015).

The graph above shows that fluctuations in the price of the world cocoa beans tend to increase. The lowest price that occurred in the period range of 1997-2018, occurred in 2000 amounted to the US \$ 903.91/ton. While the highest price occurred in 2017, amounting to US \$ 3,130.60/ton. Indonesia as the third producer of cocoa beans, intensively develop cocoa as crop plantation/ industry began in 1975. After PTP VI managed to increase cocoa production per hectare through the use of superior seeds Upper Amazon Interclonal Hybrid, which is a hybrid between clones and Sabah. Cultivation of cocoa in Indonesia is done by smallholder, private, and government.

The graph above shows that although planting cocoa initiation is conducted by the government, but in its development, it is the biggest management carried out by smallholders plantations. In 2003, smallholders plantations around 70.55%, then in 2018 this number increased to 94%. The graph above also indicates that the expansion of smallholder cocoa plantations relatively increases (65%) compared to the state plantation (94%) and private sector (100%). However, due to the cocoa plantations dominated by smallholders, presumably, this is the cause of quality cocoa classified low because the handling is still traditional.

Reviewing from the amount of production, in 2003 the total production of cocoa produced by smallholder plantations around 68.44% of the total national cocoa production. Whereas in the same year, for the state and private estates, each only 18.98% and 12.58%. However, by the end of 2018, the number of cocoa production on smallholder plantations has dominated the national cocoa production, which is about 91.71%. While the country estate only 4.21% and 4.07% private only. On the other hand, the level of productivity, the country estate only 0.64%, 0.57% smallholder plantations, and private estates 0.48%. Figures productivity of the three types of plantations, is still below the expected potential, 2 tons /ha/ year. Through the graph below 1.7, it appears that the productivity of smallholder plantations below the average national productivity.

Gonarsyah et al. (1990), explain that cocoa cropping pattern by smallholder plantations in Indonesia is generally carried out in two forms, monoculture (shade plants that do not have economic value) and intercropping (plant shade economic value). Associated with the attempt to cover the low-income levels of cocoa farmers because of low productivity, presumably cocoa crop management wherever possible intercropping, to provide economical and ecological value (Egbe & Adenikinju, 1990; Bentley et al., 2004).

Generally, shade plants used consisted of young plants such as bananas, patchouli, corn and taro, rice and green beans, and annual crops such as sengan, lamtoro, coconut (Kadir, 2018; Osei-Bonsu et al., 2002; Liyanage et al., 1984). To increase the production of cocoa beans and Indonesia's cocoa, the government through its policy instrument has made several breakthroughs. Its policy assigned to increase export as an attempt to protect domestic products to compete with foreign products. The policy is usually applied to the input and output. Associated with cocoa, following government policy related:

- 1) In 2001 the government introduced the Law No.18 of 2000 on VAT on primary commodities, which at the time of purchase of industrial raw materials cocoa beans subject to VAT of 10%, while the cocoa beans are exported free of taxes.
- 2) In 2005 the government through the Secretary of State to the Minister of Finance letter dated March 17, 2005, No. B.168 / M.Sesneg / 03/2005, providing direction that:
 - a) Raising the amount of cocoa products tariffs equal to those set in other countries.
 - b) Remove all of VAT for Cocoa Beans.
 - c) Lobbying to some countries (China) to lower tariffs for processed cocoa to match with Malaysia and Singapore is 0%.

- d) Cocoa beans are produced to be fermented.
- e) The imposition of export tax (PE) on the export of cocoa beans.
- f) Harmonization of tariffs for processed cocoa, the lowering of tariffs for processed cocoa in China to 0%.
- g) Plantation revitalization program
- h) In 2017, the government imposed an export duty on cocoa beans are exported. The policy was issued by decree of the Minister of Finance No 67 of 2010 on the Establishment of Export Goods subject to export duty, which is put into effect from April 1, 2010.

In 2016-2018, the government launched Gernas Cocoa Program which aims to improve the quality and productivity of Indonesian cocoa in a few years showed a downward trend. Cocoa Gernas program was conducted following the Plantation Law 18 of 2006.

Research Methods

This study was conducted to analyze the structure of supply and demand of Indonesian cocoa (exports) as well as the price expectations of cocoa beans and see the impact of price and non-price variables. This research was conducted with the object of Indonesia. The study period is 22 years from 2003 to 2018. The data used in this research is secondary data time series, which comes from the Central Statistics Agency (BPS), ICCO, the World Bank, and is equipped with a library study. Data collected includes total production of Indonesian cocoa beans, cocoa beans world prices, exchange rates, foreign income, cocoa plantation area in Indonesia.

Operational Definition of Variables

- 1) Cocoa beans are the seeds of the cocoa fruit are processed only at the level of producing seed (not yet processed or non-processed).
- 2) Cocoa Processed (grindings) is a processed product (derivative) of cocoa beans, cocoa powder generally consists of (cocoa powder), Cocoa butter, pasta cacao (cocoa paste or liquor), cocoa (chocolate).
- 3) Indonesian cocoa is cocoa bean production Indonesia cultivated from plantation society, government, and the private sector (tons).
- 4) Requests Indonesian cocoa production deliveries of Indonesian cocoa exports to various countries of interest (tons)
- 5) The productivity of plantations of cocoa beans is the average rate of production of cocoa beans cultivated by smallholder, state, and private, compared with the total area of the three cocoa plantations in year t (tons/ ha)
- 6) The world cocoa price is the price of cocoa beans prevailing in the international market, in this case, the used price on the London Stock Exchange (LSE) London integrated with the New York Stock Exchange (NYSE) (in US \$)
- 7) The exchange rate is the ratio between the Indonesian currency (Rupiah) in US currency (US \$).
- 8) Revenue abroad, the per capita income of countries importing cocoa beans based on constant 2000 prices (US \$).
- 9) The area of plantations of cocoa beans is an accumulation of Smallholder plantations, estates private individuals, and governments (Ha).

Data Analysis Model

The function of supply, demand, and price-expectation is a function or simultaneous equations (simultaneous equations) the estimation of the parameters or coefficients made through a "two stages least squares" (2SLS) using the program econometric Shazam (McFadden, 1984).

Result and Discussion

Supply functions of Indonesian cocoa beans

The estimation results simultaneously to the independent variables (the level of productivity of Indonesian cocoa plantations, the exchange rate, the price expectations of the world cocoa and cocoa previous year supply or lag 1) for cocoa beans supply function can be seen in Table 1 below. Where, partially significant effect on the variety of cocoa

beans supply, it is marked with R2 values of 0.9591 means, that amounted to 95.91 percent the proportion of independent variables that are used to explain the variation of the dependent variable in the model. While the rest only by 4.09 percent can be explained by other variables that are not used in this study.

A partial test of the level of significance of the effect of free variables is done by looking at the t-value ratio, (there is a consensus that in the model simultaneously, if the t-ratio is greater than one, then said to have significant). Based on Table 1, it can be seen that the variable price expectations (PE) related positively to the supply of Indonesian cocoa. This means that the higher the expected price of cocoa beans, the cocoa beans supply will increase. Response to the supply price expectations can also be seen from the amount of elasticity value. Through Table 1, it appears also that the elasticity of (0.5480), with the elasticity of less than one, means that elasticity is relatively inelastic.

Table 1
Estimation supply functions of Indonesian cocoa beans

Variable	Estimation Coefficient	The t-ratio Value	P-Value	Elasticity
A	0.2583	1.011	0.326	(0.0118)
K	(0.3267)	(1.755)	0.097	(0.2161)
PE	0.7860	6.213	0.000	0.5480
QS	0.0335	2.863	0.011	0.0319
CONSTANT	8.4430	11.00	0.000	0.6481

R-SQUARE = 0.9591

The productivity variable of cocoa Indonesia plantations (K) shows a positive value of 0.2583, a P-value of 0.097, and a 1.011 t-value ratio. This means that if the level of productivity increases then the amount of production of cocoa beans supplied will increase as well (assumption: domestic consumption of Indonesian cocoa processing industry limited / no increase).

Variable-rate (K) was negatively related (-0.3267) and real to cocoa beans supply indicated a P-value of 0.097 and the t-value ratio greater than 1 which is 1775. This suggests that if the Indonesian exchanges rate (IDR) depreciation or devaluation (reduction in the value of the currency) against the US \$, the number of cocoa beans supplied will increase. Conversely, if the appreciation occurred in the Indonesian Rupiah, the number of cocoa beans supplied will decrease because the price of Indonesian cocoa beans became more expensive.

Price expectations (PE) variable significantly related to the quantities of cocoa beans were offered. The better increased its expected price of Indonesia cocoa beans will also increase the Indonesia cocoa bean supplies to the international market. It is characterized by the t-value ratio greater than 1 (6.213) and the p-value of 0.000.

On the other hand, the number of cocoa bean supplies (QS) the previous year also had a positive relationship with the cocoa bean supplies at present. That is when the supplies of cocoa beans last year were high; cocoa beans supplies of the estimated current year will also increase. When viewed from the elasticity value indicates less elastic, where the value of 0.0319, which means the percentage, changes in supply cocoa beans last year relatively greater than the percentage change in the number of cocoa beans supply today.

Demand function of Indonesian cocoa beans

The results estimation of the demand variable for Indonesian cocoa beans can be seen in Table 2 is further analyzed as follows: partially contained three (3) independent variables (YM, P, QDt-1) that were negatively related to the demand for Indonesia cocoa beans. On the other hand, two (2) independent variable (K and T) is positively associated. This is explained by the variation of 97.72% (R2). R2 high value shows the estimated model results from this study show the real situation (Goodness of fit) or strong enough to be trusted.

Table 2
Demand function estimation of Indonesian cocoa beans

Variable	Estimation Coefficient	The t-ratio Value	P-Value	Elasticity
YM	(0.9418)	(2.999)	0.009	(0.7459)
K	0.3920	3.513	0.003	0.2658

P	(0.2511)	(2.576)	0.020	(0.1794)
QD	(0.0310)	(2.158)	0.047	(0.0296)
T	0.7498	6.299	0.000	0.1300
CONSTANT	19.820	6.107	0.000	1.5591
R-SQUARE = 0.9772				

The analytical basis for the coefficient obtained at -0.2511, the value of t ratio of 2.576, and p-value of (0,020). Income abroad variable (YM) in this case is represented by the Netherlands State's income per capita (constant in 2000) which, if their income increases or up, the demand for Indonesia cocoa beans show reduced propensity. This is because they switched to use cocoa beans from other countries that have better quality, as indicated by the value of the YM coefficient of -0.9418. Also, the t-value ratio of 2.999 and p-value 0.0009 would it be significant enough to explain the YM variable elasticity of the QD marked negative, it is clear that Indonesian cocoa is not essential goods. Increased YM does not affect the increasing number of demand. Variable "lag" 1-year request (QDL) negative, which means when the demand for cocoa beans this year is not affected by the demand for cocoa beans last year. It is characterized by the t-value ratio of 2,158 and a p-value of 0.047. Of the value of one year lag, the demand coefficient of -0.0310 so requests demanded equals the demand occurs. Constants in the cocoa demand equation are positive, it means that the demand for cocoa beans always remain even if other variables in this study is zero.

Rational price expectation functions

For this test, four criteria must be met, among others: a) unbiasedness, b) efficiency, c) forecast error unpredictability, and d) consistency. (Sheffrin, 1989; Sheffrin, 1989). From the four criteria mentioned above, there are two important things to be done that are not biased and efficient criteria. So both of these criteria will be tested in advance whether the model is not biased and inefficient. The test results of the bias parameter and efficiency, obtained as follows:

After testing the model of rational expectations turns out that used in this study was not biased, because of the value of the coefficient $0 = \alpha$ and the coefficient $1 = \beta$ (see attachment). The model used is $X_t = \alpha + \beta_{t-k} X_t + \varepsilon$ with the value of the estimated coefficient for $\beta = 1$ and $\alpha = 0$ variable $X_t = X_t$ * Variable rational expectations.

After testing the rational expectations models used efficiently even this turned out requirements are met (see attachment), so that the rational expectations models used in this econometric study pass the test, therefore the estimation results obtained from the model can be used to estimate equation structural transformation as desired. The model used is $X_t = \beta_1 X_{t-1} + \beta_2 X_{t-2} + \dots + \beta_n X_{t-n} + \mu_t$, where the value α must be the same as the value of β_i for all i.

The estimation results of the function of rational price expectations are shown in Table 3, the table appears that the independent variables used in the model jointly significant influence the dependent variable. This is indicated by the R2 value of 0.9754. This indicates that the proportion of variation of independent variables used in the model is the variable number of deals cocoa beans (QS), overseas revenue (YM), price (P), Total demand (QD), and trend (T) can explain the variation in the dependent variable is rational price expectations by 97.54 percent, while the remainder is equal to 2.46 percent is explained by other variation outside the model. R2 high value shows the estimated model results from this study show enough real situation (Goodness of fit) or strong enough to be trusted.

Table 3
Estimation of rational price expectation functions

Variable	Estimation Coefficient	The t-ratio Value	P-Value	Elasticity
QS	(0.1766)	(0.8781)	0.393	(0.2412)
YM	0.4591	0.433	0.433	0.5089
P	0.2347	0.0833	0.083	0.2347
QD	0.0839	0.684	0.684	0.1120
T	0.9362	0.011	0.001	0.2271
CONSTANT	1.4391	0.810	0.810	0.1584
R-SQUARE = 0.9754				

Variable lag one year supply (LAQS) statistically significant negative effect on the variation of the expected value price of cocoa beans, which are marked with a t-value ratio of -0.8781 and p-value for 0393, meaning that if the last year supply decreased, then expectations it is expected that the price of cocoa beans will rise in the coming year. When viewed from the elasticity coefficient of -0.2412 relatively inelastic, meaning that the percentage changes in cocoa beans supply last year is greater than the percentage change in price cocoa beans price expectations. Variable lag 1-year demand for cocoa beans (LAQD) is a statistically positive and significant effect on the variation of the expected value price of cocoa beans, which are marked with a t-value ratio of 0.4142, which means when the demand for cocoa beans last year increased, then it will affect the rising price expectations of cocoa beans.

Model Simulation

Simulation analysis used in this study is the method of shock simulation, assuming the variable used is the level of productivity of Indonesian cocoa plantations. Changes discrete determined by 10% and 20%. Changes that occur later are observed in the model stability after the shocks. Based on the results of model simulations using the Gauss-Seidel method with two scenarios, namely; The first scenario productivity levels increased by 20 percent and scenarios into two productivity levels increased to 10 percent as shown in Table 4 and 5.

Table 4
The scenario of productivity rising by 20%

Type of function	Literacy				
	I	II	III	IV	V
Bidding	11.8105	11.8105	11.8105	11.8105	11.8105
Request	11.5589	11.5589	11.5589	11.5589	11.5589
Price expectations	7.7836	7.7836	7.7836	7.7836	7.7836

There is well known that the three functions such as: price offer, demand, and expectation are convergent and have been in equilibrium at the second iteration for the two scenarios with less decreasing. It is also shown in the second scenario in table 5.

Table 5
The scenario of productivity rising

Type of function	Literacy				
	I	II	III	IV	V
Bidding	11.8343	11.8343	11.8343	11.8343	11.8343
Request	11.5589	11.5589	11.5589	11.5589	11.5589
Price expectations	7.7836	7.7836	7.7836	7.7836	7.7836

Therefore, the two scenarios concluded that productivity-increasing of cacao farm in Indonesia don't directly affect the amount of cacao offer. Meanwhile, the demand and expectation function doesn't change. Because the last two functions don't affect cacao farm productivity.

Conclusion

Through a "two-stage least squares" (2 SLS) on the function of supply, demand, and price expectations of functionality, the conclusions, and suggestions on the results of this study are:

That on the supply function of Indonesian cocoa on the international market, with the independent variables, are used (level of productivity of Indonesian cocoa plantations, the exchange rate, the price expectations of the world cocoa and cocoa previous year supply or lag 1) shows that the variation deals cocoa beans can be explained by a variable-variable in the model, amounting to 95.91 percent. Variable price expectations (PE), the productivity of Indonesian cocoa plantations (K), the number of deals cocoa beans (QS) has a positive relationship with the cocoa beans supply at present. While variable-rate (K) was negatively related.

The results of the estimation of the variable demand for cocoa beans Indonesia shows that there are three (3) independent variables (YM, P, QDt-1) was negatively related and two (2) independent variable (K and T) positively associated, with a variation of 97.72% (R²). Case This indicates that the estimated models generated from this study show enough actual state (goodness of fit) or strong enough to be trusted.

Model rational price expectations are a function of the whole information (in the system) that are external (minus variable productivity) plantations or A) shows that the model of the rational price expectations is unbiased and efficient. Variations independent variables used in the model is the variable number of deals cocoa beans (QS), overseas revenue (YM), price (P), Total demand (QD), and trend (T) can explain the variation in the dependent variable at 97.54 percent. Through simulation analysis on a variable rate of Indonesian cocoa plantations productivity by 10% and 20%, that the three functions, namely supply, demand, and price expectations all leading convergent and have achieved a balance in the second iteration.

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